

An SDO/AIA-Observed Filament Eruption Triggered by a Lid-Removal Onset Mechanism

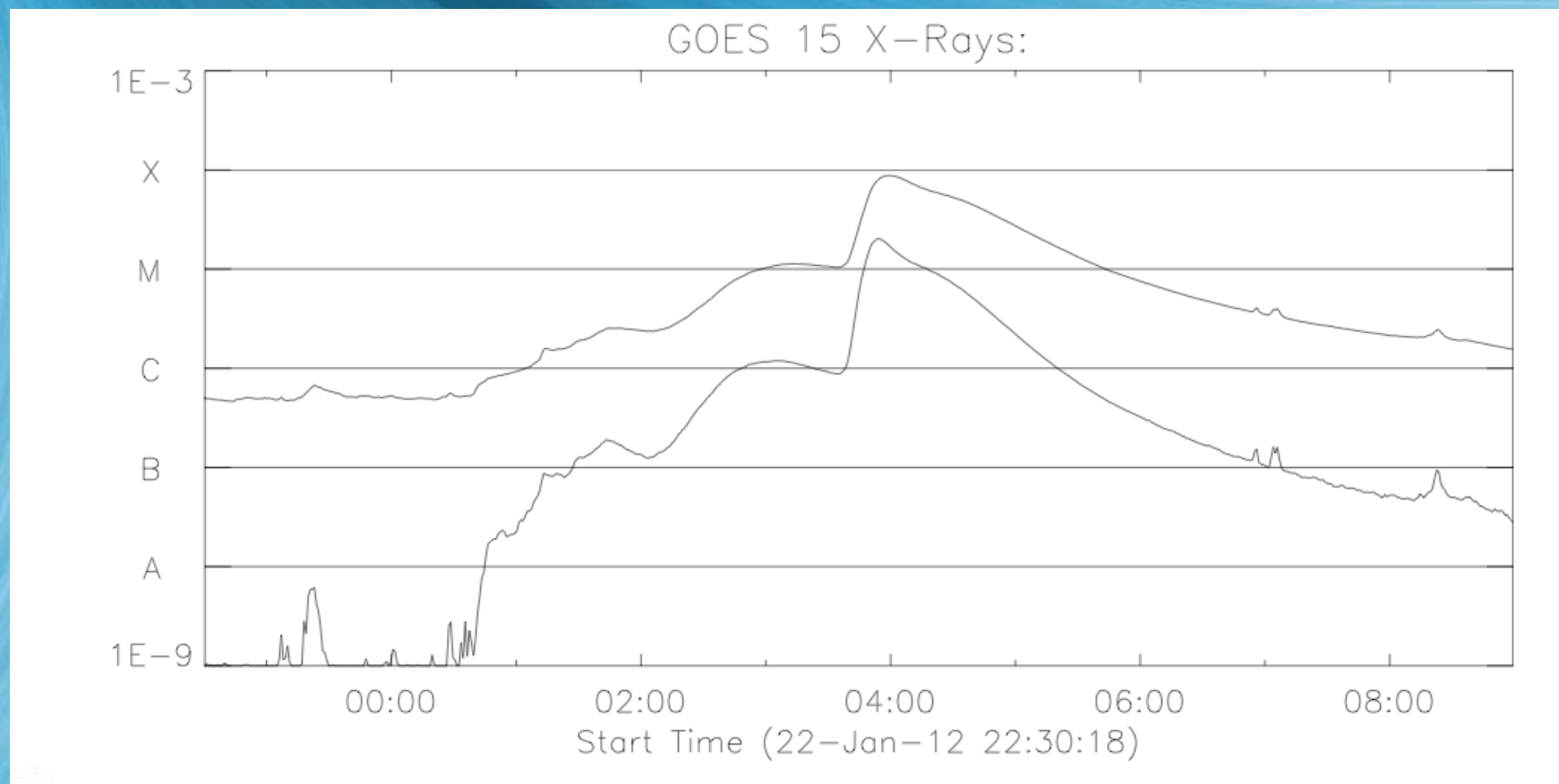
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Javon M. Knox; Norfolk State U, Norfolk, VA

An AR Ejective Eruption from SDO and STEREO-A

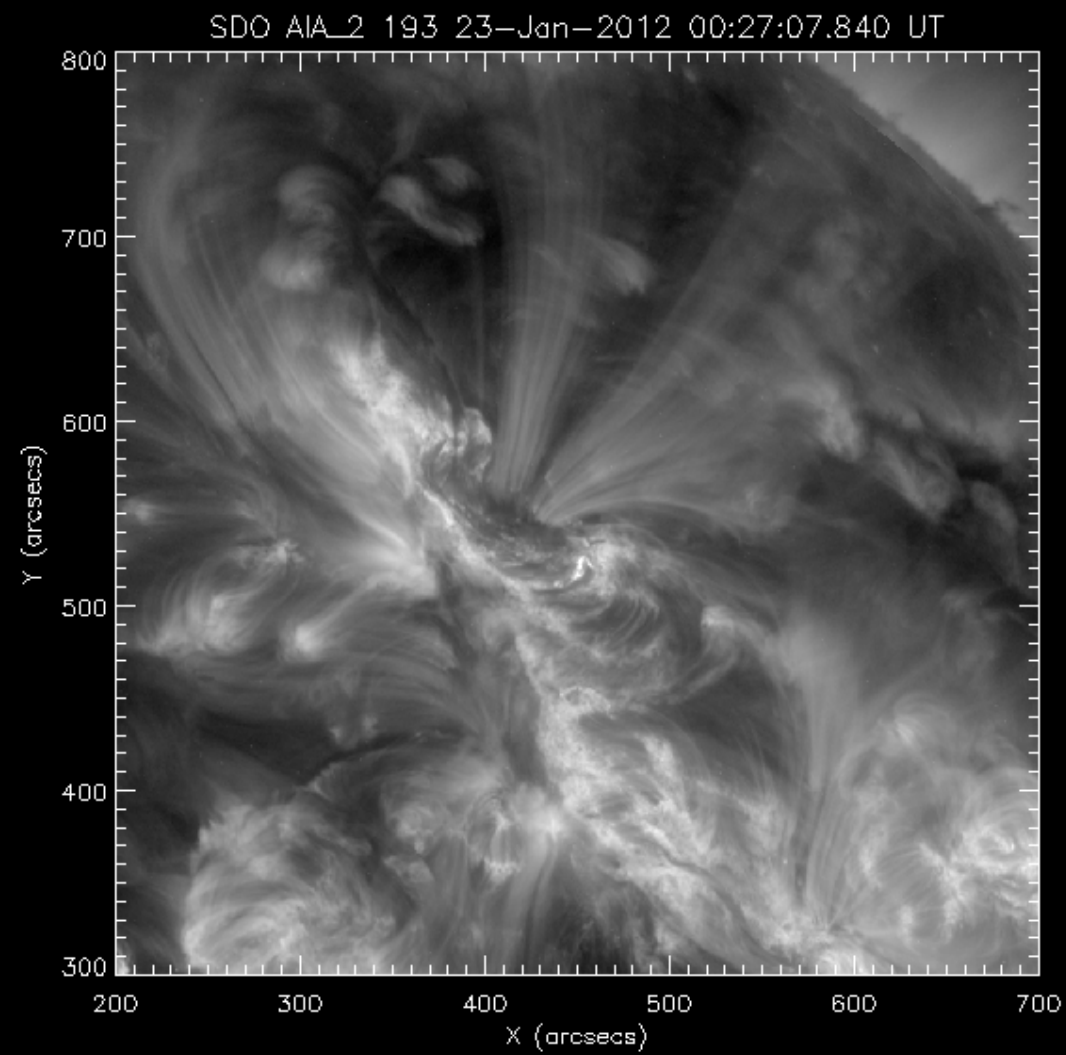
- ♦ Active region eruption of 2012 January 23.
- ♦ Ejective eruption.
- ♦ GOES class M8.7 flare.
- ♦ SDO/AIA, various filters (304, 171, 193, 211, 131, 335, 94 Ang.)
- ♦ High (adequate!) time cadence (145 s) and high spatial resolution (0".6 pixels).
- ♦ SDO/HMI line-of-sight magnetograms.
- ♦ On-disk from SDO, limb event from STEREO A.

We will: Overview the full eruption sequence.

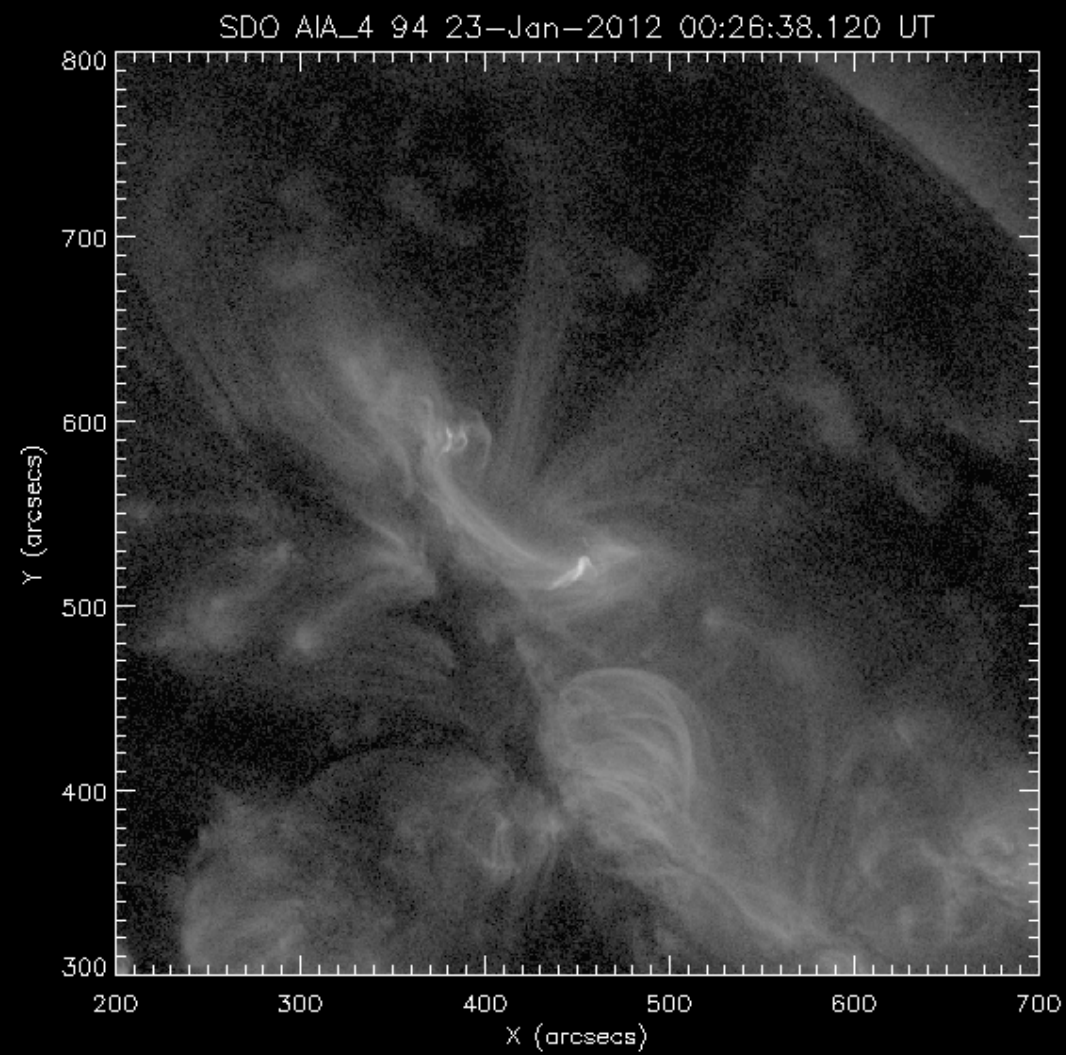
Main focus: What is going on in the onset phase?



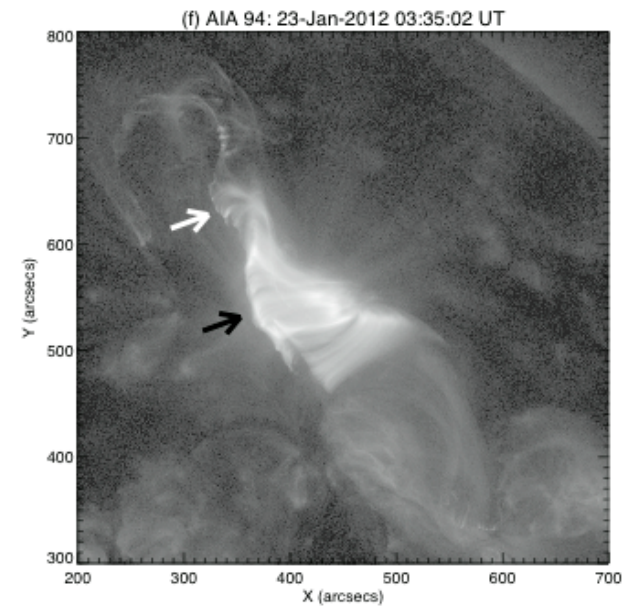
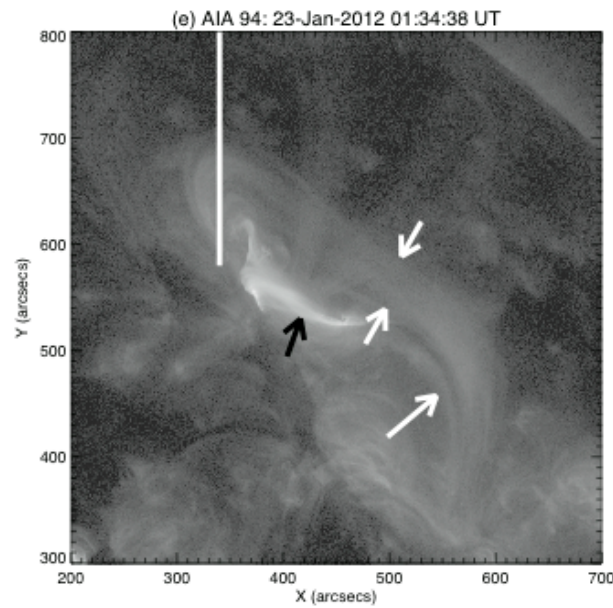
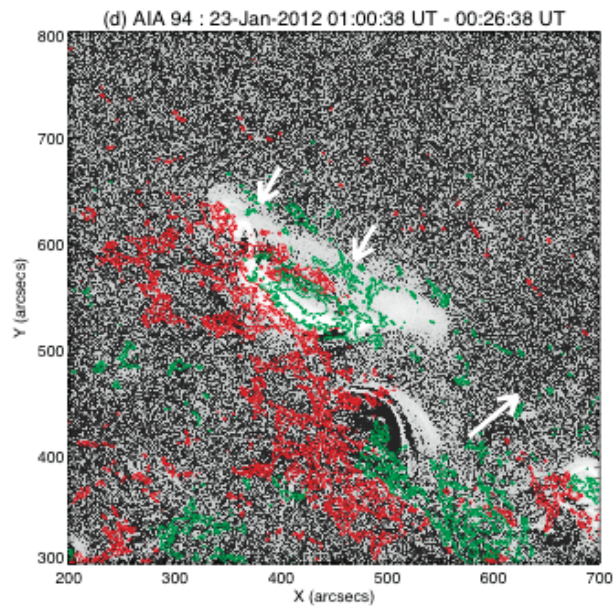
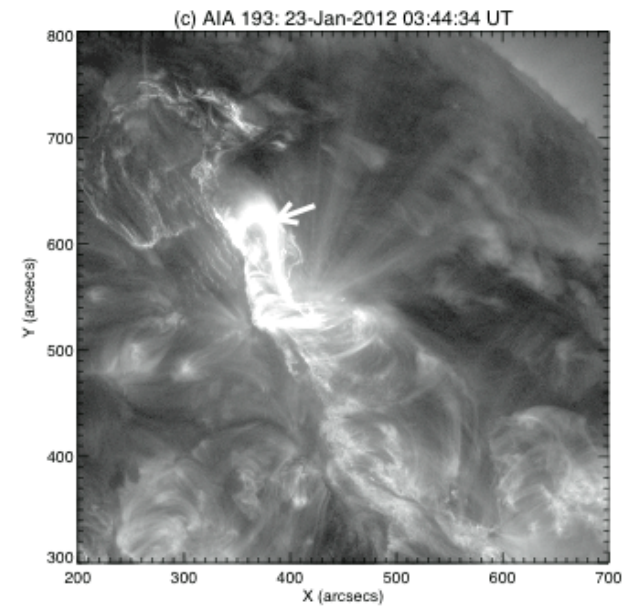
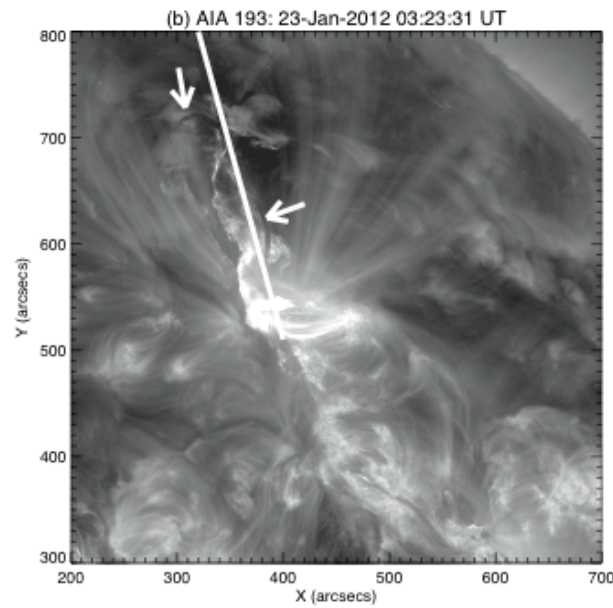
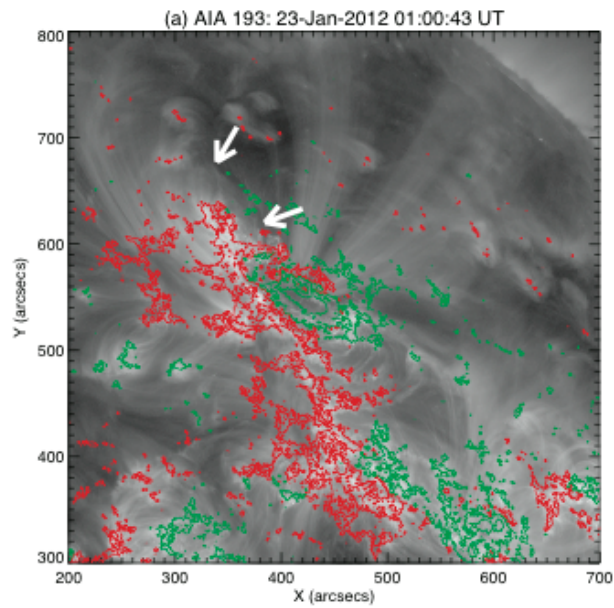
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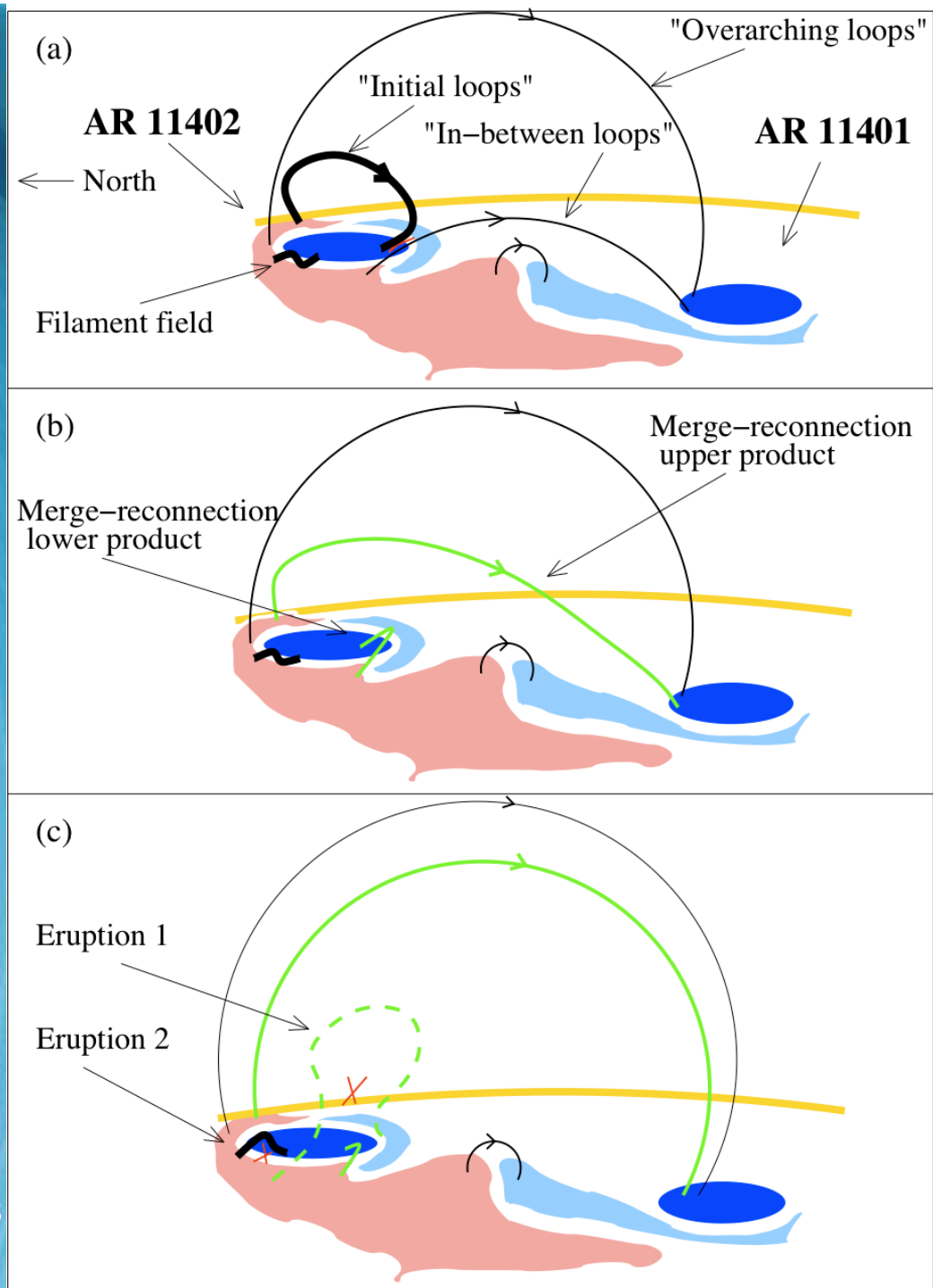


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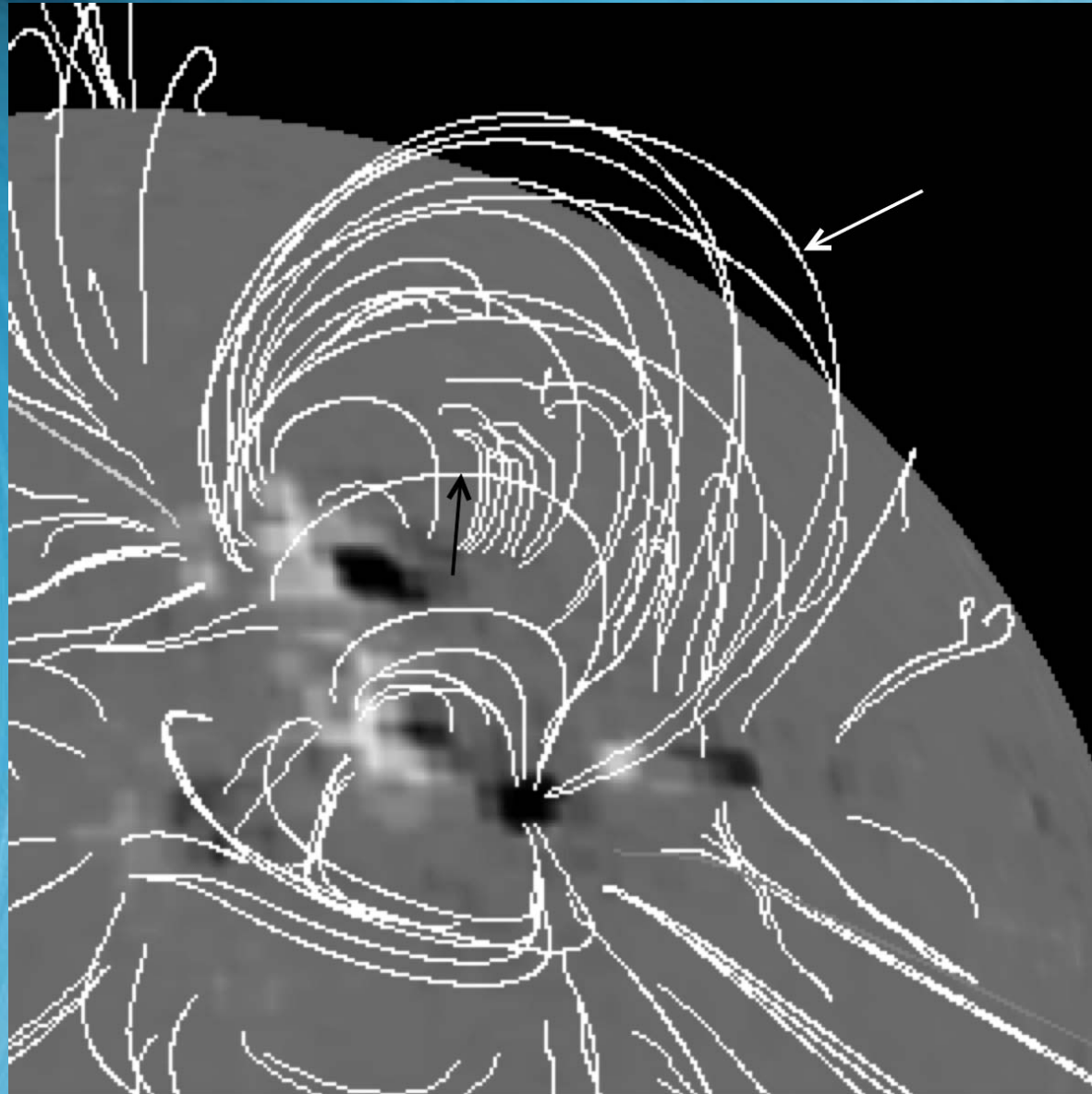


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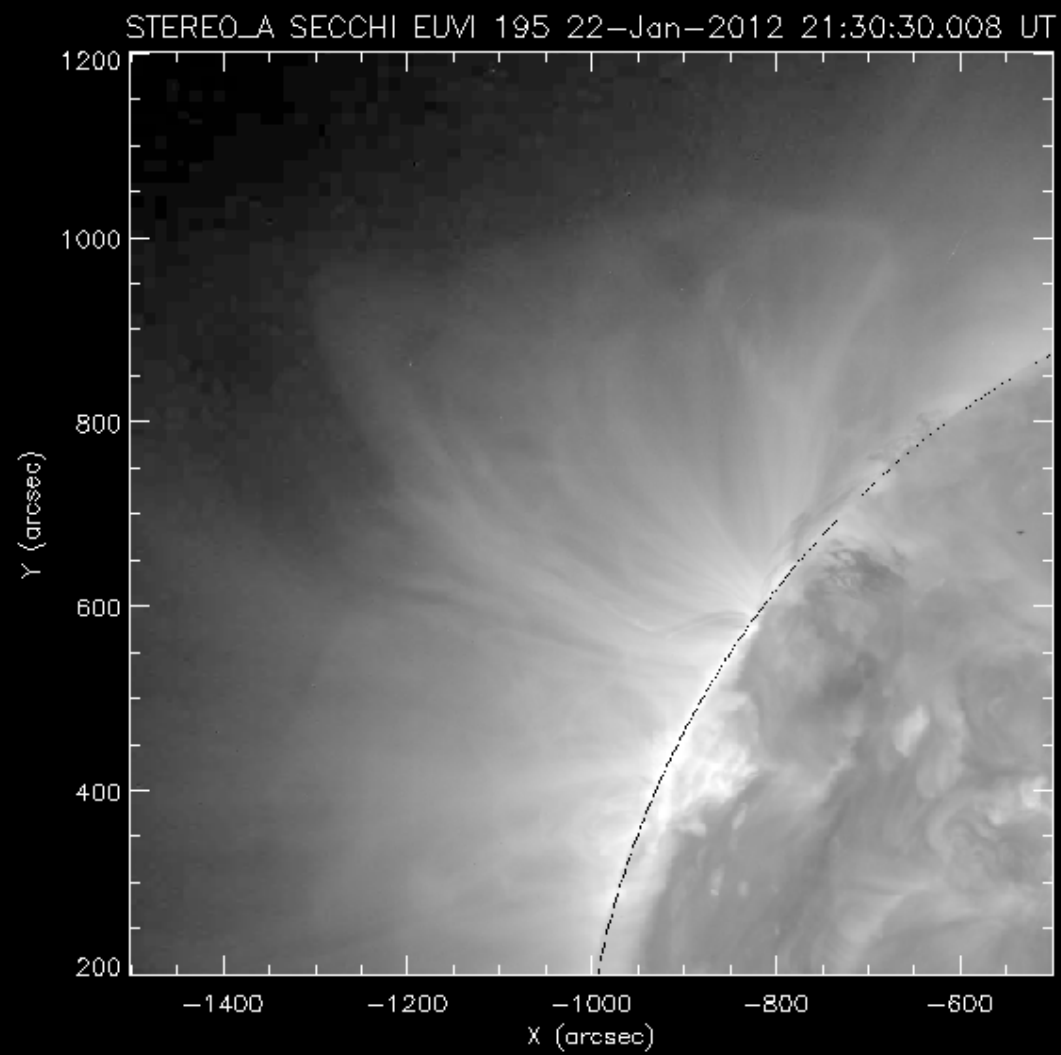




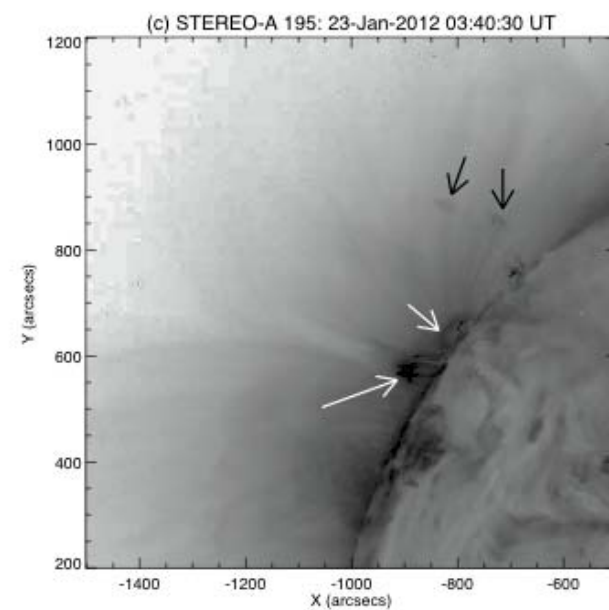
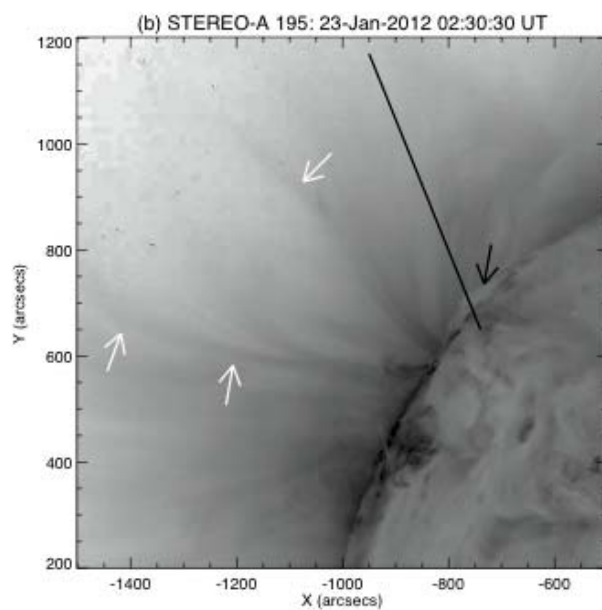
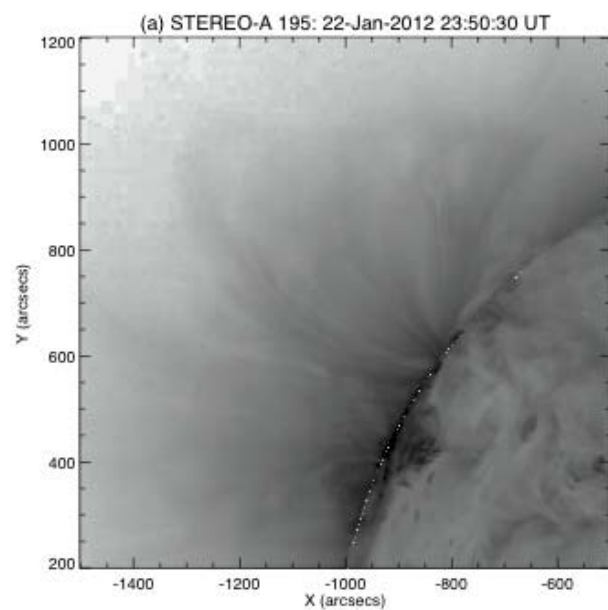
PFSS Model (Schrijver & DeRosa 2003)



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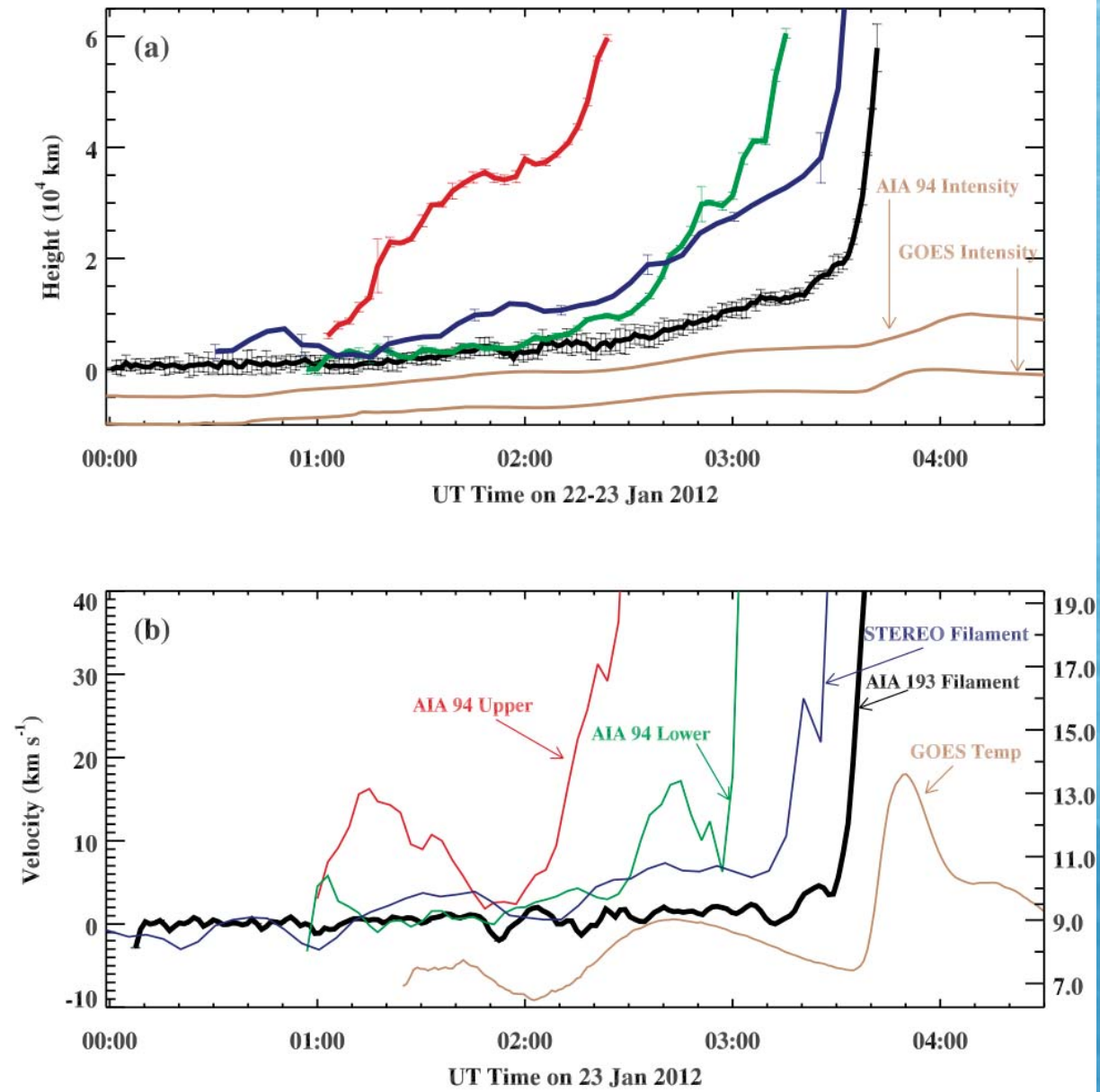


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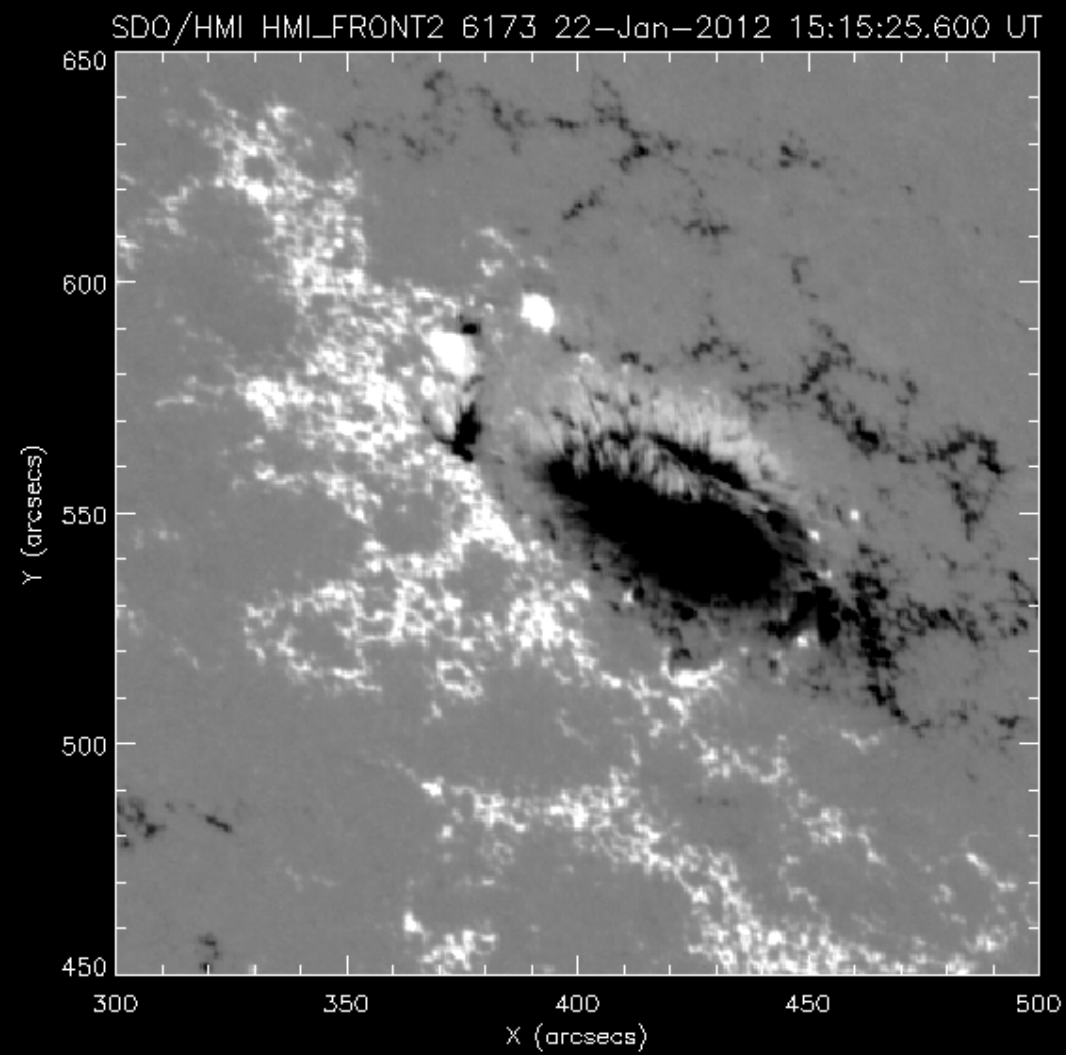


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- There are two eruptions (“eruption 1” and “eruption 2”), the latter including the filament. (Both components visible in LASCO CME images.)
- Eruption 1 nearly invisible in cooler on-disk EUV images, but appears as field opening in limb view (STEREO A).
- An even earlier brightening is due to “merging reconnection” (and eruption 1 flare).
- Filament eruption (eruption 2) is due to removal of overlaying flux by eruption 1.
- This “Lid Removal” mechanism is an ideal, non-resistive process. NB., it differs from the breakout mechanism.

What causes Eruption 1 onset?

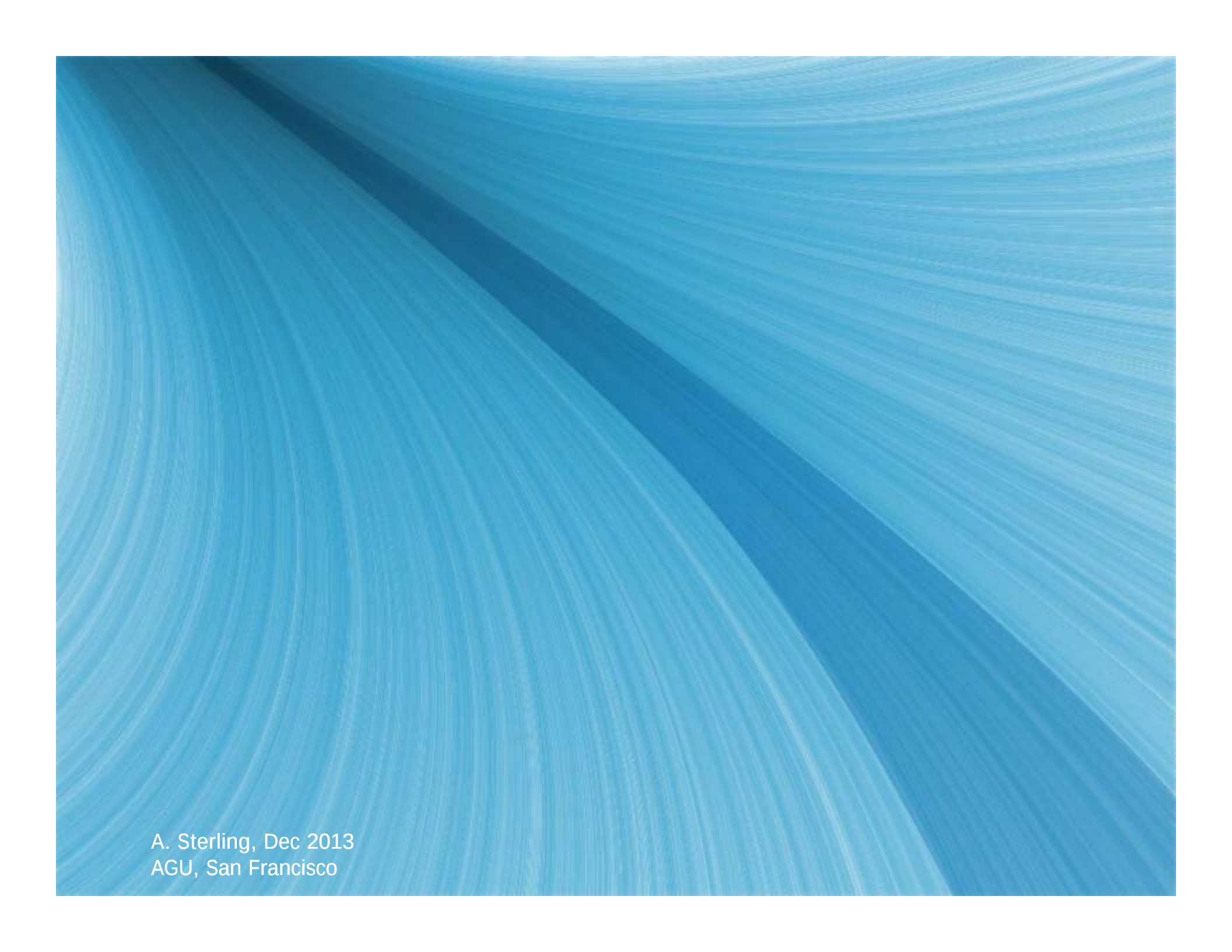
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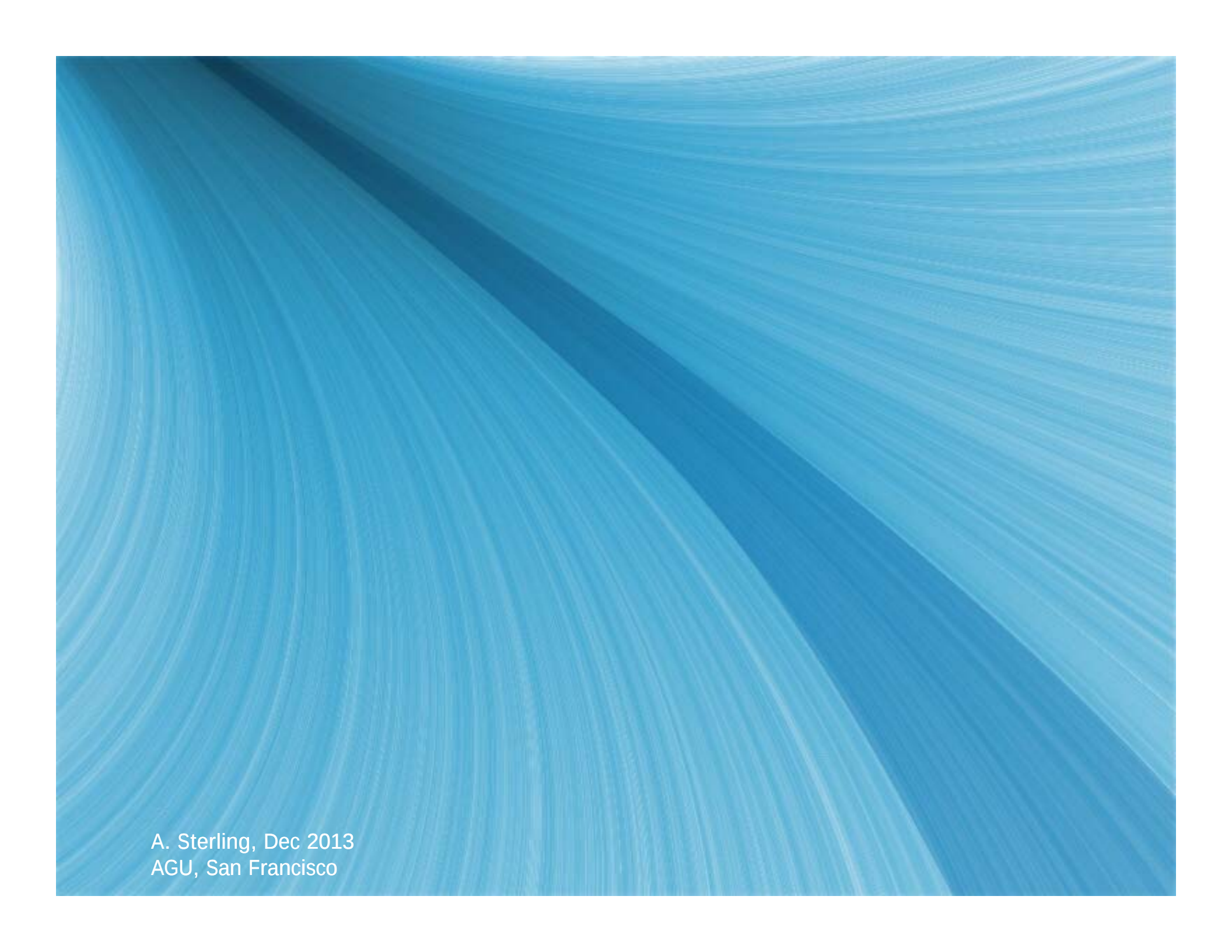
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Conclusions (2012 Jan 23 event)

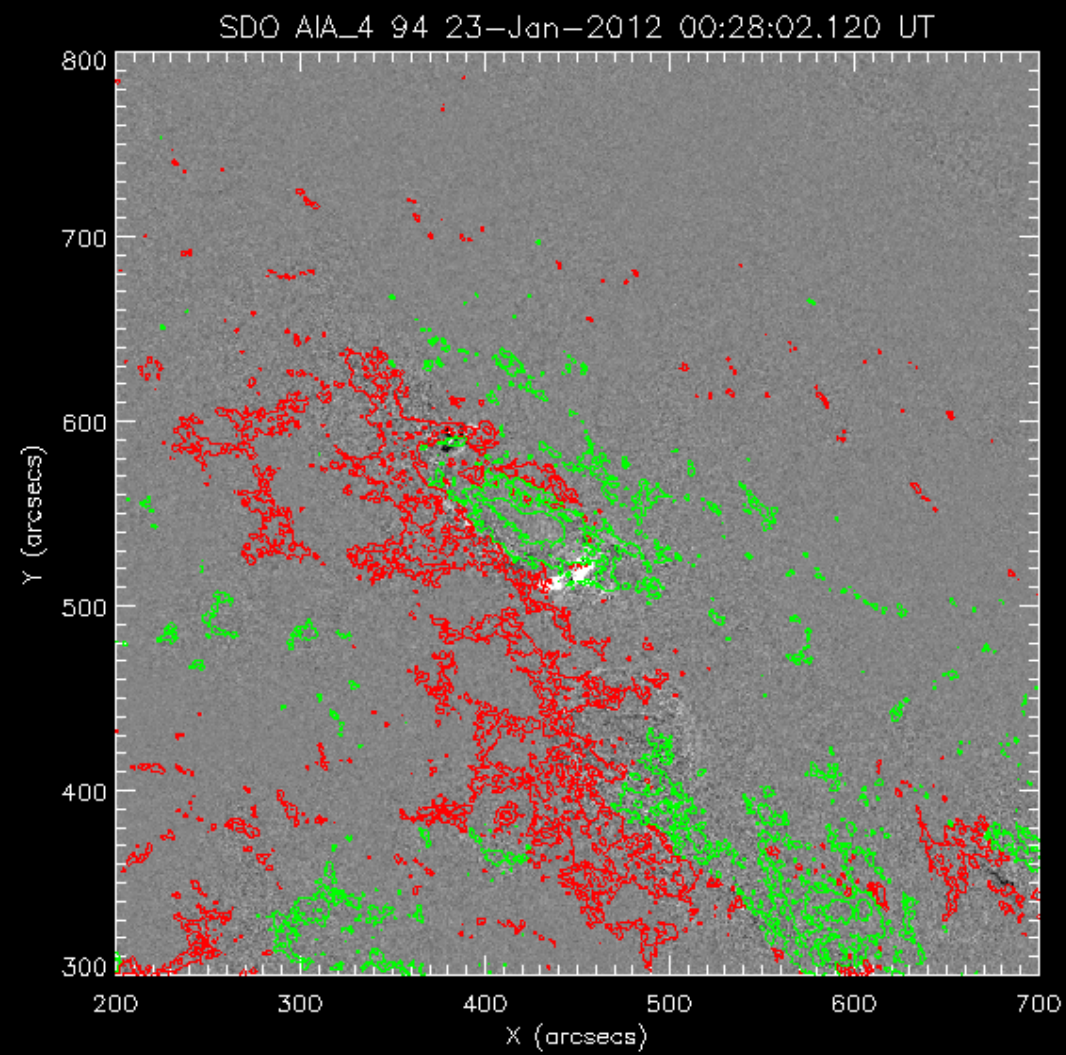
- ◆ Something causes eruption 1; could be flux cancelation from MMFs.
- ◆ Eruption 1 field merges with neighboring region, with hot-plasma signature.
- ◆ Eruption 1 removes field above filament arcade.
- ◆ This leads to destabilization and onset of eruption 2, creating the strongest and hottest GOES flare via Lid Removal.
- ◆ Similar processes: E.g. Schrijver & Title (2011), Titov et al. (2012).
- ◆ Poster SH13A-2025 (Knox et al.) discussed filament-trajectory shape for this event.

The background of the slide is a solid blue color with a subtle, wavy texture. A prominent, darker blue diagonal band runs from the top-left towards the bottom-right, creating a sense of movement and depth. The overall effect is a modern, abstract design.

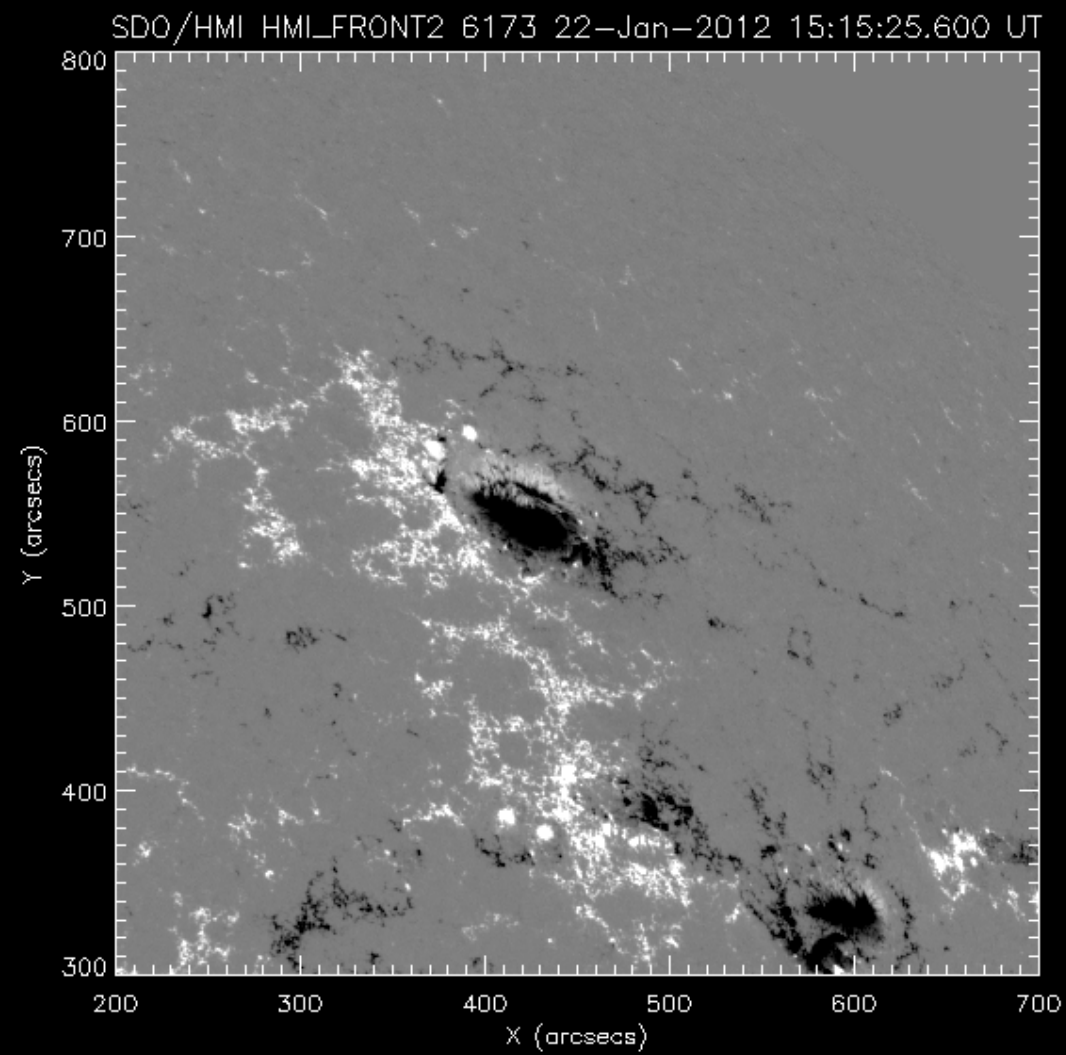
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